Healthcare-Associated Hepatitis B and C Outbreaks[1] Reported to the Centers for Disease Control and Prevention (CDC) in 2008-2011

The tables below summarize healthcare-associated outbreaks of hepatitis B virus (HBV) and hepatitis C virus (HCV) infection reported in the United States during 2008-2011. Outbreaks previously reported in 1998-2008 can be found in Thompson, et al. Because of the long incubation period (up to 6 months) and typically asymptomatic course of acute hepatitis B and C infection, it is likely that only a fraction of such outbreaks that occurred have been detected, and reporting of outbreaks detected and investigated by state and local health departments is not required. Therefore, the numbers reported here may greatly underestimate the number of outbreak-associated cases and the number of at-risk persons notified for screening.

Summary

31 outbreaks of viral hepatitis related to healthcare reported to CDC during 2008-2011; of these, 29 (94%) occurred in non-hospital settings.

Hepatitis B (total 19 outbreaks, 155 outbreak-associated cases, 10,318 persons notified for screening):

- 15 outbreaks occurred in long-term care facilities, with at least 118 outbreak-associated cases of HBV and approximately 1,600 at-risk persons notified for screening
    - 80% (12/15) of the outbreaks were associated with infection control breaks during assisted monitoring of blood glucose (AMBG) (Note: a total of 30 long term care facility HBV outbreaks occurred during 1996-2011, of these 27 [90%] were associated with infection control breaks during AMBG.[1, 2,below])
- 4 outbreaks occurred in other settings, one each at: a free dental clinic in school gymnasium, an outpatient oncology clinic, a hospital surgery service, and a pain remediation clinic, with at least 37 outbreak-associated cases of HBV and approximately 8,722 at-risk persons notified for screening
    - infection control breaks varied in these settings

Hepatitis C (total 13 outbreaks, 102 outbreak-associated cases, 80,649 at-risk persons notified for screening):

- 7 outbreaks occurred in outpatient facilities (including one outbreak of both HBV and HCV), with at least 30 outbreak-associated cases of HCV and >68,579 persons notified for screening
- 5 outbreaks occurred in hemodialysis settings, with at least 46 outbreak-associated cases of HCV and 1,311 persons notified for screening

- One outbreak occurred because of drug diversion by an HCV-infected surgery technician, with at least 24 outbreak-associated cases of HCV and 8,000 persons notified for screening

Resources for prevention include updated hepatitis B immunization guidelines, and infection control guidelines and resources.

Hepatitis B (HBV) Outbreaks by Setting						
Setting	**Year**	**State**	**Persons Notified for Screening[2]**	**Outbreak-Associated Infections[3]**	**Known or suspected mode of transmission[4]**	**Comments**
Long-term care						
Assisted living facility (3)	2008	IL	21	7	Use of blood glucose meter for >1 resident without cleaning and disinfection Failure to consistently wear gloves and perform hand hygiene between fingerstick procedures	
Assisted living facility (2)	2008	PA	25	9	Use of fingerstick devices for >1 resident Use of blood glucose meter for >1 resident without cleaning and disinfection	
Skilled nursing facility (4) *(most residents with neuropsychiatric disorders)*	2008	CA	143	9	Failure to maintain separation of clean and contaminated podiatry equipment	

Hepatitis B (HBV) Outbreaks by Setting						
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Assisted living facilities (n=2) (5) Blood glucose monitoring at both assisted-living facilities provided by same home health agency	2009	FL	65	9	Cross-contamination of clean supplies with contaminated blood glucose monitoring equipment used by home health agency *Investigators noted visible traces of blood on some of the blood glucose meters and one reusable fingerstick device.*	

Hepatitis B (HBV) Outbreaks by Setting						
Setting	**Year**	**State**	**Persons Notified for Screening[2]**	**Outbreak-Associated Infections[3]**	**Known or suspected mode of transmission[4]**	**Comments**
Assisted living facility (6)	2009	VA	64	5	Unsafe practices related to assisted blood glucose monitoring *A clear infection prevention breach was not identified. The facility did use reusable fingerstick devices but denied using them for >1 resident. In an analytic study, having diabetes and undergoing blood glucose monitoring (all 5 acute cases and 4 of 5 newly identified chronic cases) was significantly associated with infection*	An additional 5 new chronic infections An additional 5 new chronic infections were detected; of these 4 had viral molecular sequencing and all matched into the cluster with the acute cases indicating likely outbreak-related cases. 2 of 17 facility staff tested also had acute HBV. Investigators identified that after performing AMBG, personnel manually removed used, exposed lancets from the fingerstick device, placing themselves at risk for exposure via a sharps injury. Neither staff member received HBV vaccination.

Hepatitis B (HBV) Outbreaks by Setting						
Setting	**Year**	**State**	**Persons Notified for Screening[2]**	**Outbreak-Associated Infections[3]**	**Known or suspected mode of transmission[4]**	**Comments**
Assisted living facility (7)	2010	CA	28	3	Unsafe practices related to assisted blood glucose monitoring *Although a clear infection prevention breach was not identified at the time of the investigation, all infections were in residents receiving assisted monitoring of blood glucose by the same home health agency. The home health agency lacked written policies on infection control relating to blood glucose monitoring.*	
Skilled nursing facility (8)	2010	NC	87	8	Use of fingerstick devices for >1 resident Use of blood glucose meter for >1 resident without cleaning and disinfection	6 of 8 case patients died from complications of hepatitis

Hepatitis B (HBV) Outbreaks by Setting						
Setting	**Year**	**State**	**Persons Notified for Screening[2]**	**Outbreak-Associated Infections[3]**	**Known or suspected mode of transmission[4]**	**Comments**
Assisted living facilities (>10) in the same metropolitan area served by the same home health agency for diabetic care (10)	2010	TX	>400	23	Unsafe practices related to assisted blood glucose monitoring	Cases include residents of the assisted living facilities plus one family member of an infected facility resident who experienced a needlestick injury while assisting with the resident's blood glucose monitoring.
Patients living at home in private residences served by the same home health agency above for diabetic care (10)			≥19	1	*Although a clear infection prevention breach was not identified at the time of the investigation, all infections were in residents of assisted living facilities or at home who received assisted monitoring of blood glucose by the same home health agency.*	
Two affiliated assisted living facilities (6, 11) *(most residents with neuropsychiatric disorders)*	2010	VA	126	14	Use of fingerstick devices for >1 resident Use of blood glucose meter for >1 resident without cleaning and disinfection Failure to use gloves and perform hand hygiene between fingerstick procedures	An additional 4 new chronic infections were detected and had viral molecular sequencing; 3 matched into the clusters with the acute cases indicating likely outbreak-related cases.

Hepatitis B (HBV) Outbreaks by Setting						
Setting	**Year**	**State**	**Persons Notified for Screening[2]**	**Outbreak-Associated Infections[3]**	**Known or suspected mode of transmission[4]**	**Comments**
Assisted living facility after transfer of a resident from assisted living facility above (6)	2010	VA	151	5	Use of fingerstick devices for >1 resident	
Skilled nursing facility (12)	2010	NC	116	6	Unclear mode of transmission; specific lapses in infection control not identified at the time of the investigation.	
Assisted living facility (13)	2010	NC	109	6	Specific lapses in infection control not identified at the time of the investigation. *However, assisted blood glucose monitoring and insulin injection (received by 4 of 6 infected patients) associated with illness in case-control study.*	
Assisted living facility (6) *(most residents with neuropsychiatric disorders)*	2011	VA	103	7	Use of fingerstick devices for >1 resident	An additional 4 new chronic infections were detected; of these 3 had viral molecular sequencing and all matched into the cluster with the acute cases indicating likely outbreak-related cases.

Hepatitis B (HBV) Outbreaks by Setting						
Setting	**Year**	**State**	**Persons Notified for Screening[2]**	**Outbreak-Associated Infections[3]**	**Known or suspected mode of transmission[4]**	**Comments**
Assisted living facility (14)	2011	CA	14	2	Use of blood glucose meter for >1 resident without cleaning and disinfection Failure to maintain separation of clean and contaminated podiatry equipment Improper reprocessing of contaminated podiatry equipment Failure to perform environmental cleaning and disinfection between podiatry patients	Both infected residents received assisted monitoring of blood glucose as well as podiatry services.
(See footnote 5)						
Totals			***>1,471***	***114***		
Other outpatient Settings						
Outpatient oncology clinic (15)	2009	NJ	4,600	29	Preparation of medications in same area where blood specimens were processed Use of saline-bags for >1 patient Use of single-dose vials for >1 patient	
Free dental clinic conducted in school gymnasium (16)	2009	WV	>1,500	5	Multiple procedural and infection control breaches were identified during retrospective investigation; however, sparse documentation did not provide evidence to link specific breaches with infection.	Of the 5 cases, 3 were patients and 2 were non-healthcare worker volunteers
Totals			***>6,100***	***34***		

Hepatitis B (HBV) Outbreaks by Setting						
Setting	**Year**	**State**	**Persons Notified for Screening**[2]	**Outbreak-Associated Infections**[3]	**Known or suspected mode of transmission**[4]	**Comments**
Hospital						
Hospital-based surgery service (17)	2009	VA	**329**	**2***	HBV-infected orthopedic surgeon with high viral load performing exposure-prone procedures on patients	*An additional 4 resolved HBV infections may also have been associated with this outbreak

Outbreak of both Hepatitis B and Hepatitis C						
Setting	**Year**	**State**	**Persons Notified for Screening**[2]	**Outbreak-Associated Infections**[3]	**Known or suspected mode of transmission**[4]	**Comments**
Outpatient						
Pain remediation clinic (18)	2010	CA	**2293**	HBV:**1** HCV:**1**	Syringe reuse contaminating medication vials used for >1 patient Use of single-dose vials for >1 patient	

Hepatitis C (HCV) Outbreaks by Setting						
Setting	**Year**	**State**	**Persons Notified for Screening[2]**	**Outbreak-Associated Infections[3]**	**Known or suspected mode of transmission[4]**	**Comments**
Outpatient						
Ambulatory surgical centers (single-purpose endoscopy clinics) (n=2) (19, 20, 21)	2008	NV	>60,000	9	Syringe reuse contaminating single-use medications vials (propofol) that were used for >1 patient	8 cases were from the first center and one from the second. The health department identified an additional 106 infections that could have been linked to the clinics.
Outpatient cardiology clinic (24)	2008	NC	1,200	5	Syringe reuse contaminating multi-dose vials of saline solution used for >1 patient	An additional 2 new infections were identified in probable source patients
Outpatient alternative medicine clinic (23)	2009	FL	163	9	Syringe reuse contaminating medication vials used for >1 patient Use of single-dose vials for >1 patient	
Endoscopy clinics (24)	2009	NY	3287	2	Suspected syringe reuse contaminating medication vials	2009 investigation of cases occurring in 2006- 2007
Outpatient clinic (25)	2010	FL	3,929	5	Drug diversion (fentanyl) by an HCV-infected radiology technician	

Hepatitis C (HCV) Outbreaks by Setting						
Setting	**Year**	**State**	**Persons Notified for Screening[2]**	**Outbreak-Associated Infections[3]**	**Known or suspected mode of transmission[4]**	**Comments**
Pain management clinic (26)	2011	NY	466	2	Suspected syringe reuse contaminating medication vials	
Totals			***>69,045***	***32***		
Hospital						
Hospital-based surgery service (27)	2009	CO	**>8,000**	**24**	Drug diversion (fentanyl) by an HCV-infected surgical technician	18 cases were linked by viral sequencing to the surgical technician; an additional 6 infections were determined to be epidemiologically linked but viral sequencing was not able to be performed. The number screened includes patients from three facilities where the surgical technician had worked.
Hemodialysis						
Dialysis center (28)	2008	NY	657	9	Multiple breaches in infection control practice (unspecified)	All patients who received dialysis in this facility since 2004 were notified for screening

Hepatitis C (HCV) Outbreaks by Setting						
Setting	**Year**	**State**	**Persons Notified for Screening[2]**	**Outbreak-Associated Infections[3]**	**Known or suspected mode of transmission[4]**	**Comments**
Outpatient hemodialysis facility (29)	2009	MD	250	8	Breaches in medication preparation and administration practices Breaches in environmental cleaning and disinfection practices	
Hospital-based hemodialysis facility (30)	2009	NJ	144	21	Breaches in medication preparation and administration practices Breaches in environmental cleaning and disinfection practices	All patients who received dialysis in this facility since 2005 were notified for screening
Dialysis center (31)	2010	TX	171	2	Breaches in infection control practice (unspecified)	
Dialysis center (32)	2011	GA	89	6	Breaches in medication preparation Failure to maintain separation between clean and contaminated workspaces	
Totals			***1311***	***46***		

1 Outbreaks with two or more outbreak-related infections detected are included.

2 The number of persons notified for screening is dependent upon information and resources available at the time of investigation and may underestimate the total number of individuals at risk.

3 Outbreak-associated HBV and HCV infections are defined as those with epidemiologic evidence supporting healthcare related transmission and include patients/residents identified with acute infection, or previously undiagnosed chronic infections with epidemiologic evidence indicating that these were likely outbreak-related incident cases that progressed from acute to chronic. Patients/residents identified as likely (previously infected) sources for transmission are not included. In the outbreak investigation setting case definitions are based on laboratory profile and clinical evidence rather than CDC surveillance case definitions which omit asymptomatic cases. Acute HBV is typically defined as having a positive hepatitis B surface antigen and positive IgM core antibody, or positive surface antigen and negative total core antibody (early infection). Chronic HBV is typically defined as having a positive hepatitis B surface antigen, positive total core antibody and negative IgM core antibody. There are no serologic markers to differentiate between acute and chronic HCV infection; defining an infection as possible healthcare transmission is dependent upon epidemiologic evidence along with a new finding of hepatitis C antibody and/or RNA positivity in a person not previously known positive (whether or not symptoms or alanine aminotransferase [ALT] elevation are present).

4 All modes of transmission are patient-to-patient unless otherwise indicated.

5 One additional healthcare facility outbreak was reported during 2009, in an Illinois psychiatric long term care facility with 8 outbreak-related hepatitis B cases among 180 residents screened, and an additional three cases of chronic HBV infection detected at the time of screening. The likely mode of transmission was sexual contact, though other behavioral risk factors such as illicit drug use could not be ruled out.
Source: Jasuja S, Thompson N, Peters P et al. Investigation of hepatitis B virus and human immunodeficiency virus transmission among severely mentally ill residents at a long term care facility. Submitted.

References:

1. Nosocomial hepatitis B virus infection associated with reusable fingerstick blood sampling devices -- Ohio and New York City, 1996. MMWR 1997; 46:217-221.

2. Thompson ND, Perz JF, Moorman AC, Holmberg SD. Nonhospital health care-associated hepatitis B and C virus transmission: United States, 1998-2008. Ann Intern Med 2009;150:33-9.

3. Counard C, Perz J, Linchangco P, et al. Acute hepatitis B outbreaks related to fingerstick blood glucose monitoring in two assisted living facilities. J Am Geriatr Soc 2010; 58:306-311.

4. Wise ME, Marquez P, Sharapov U, Hathaway S, et al. Outbreak of acute hepatitis B infections at a psychiatric long term care facility. Am J Infect Control 2012: 40: 16-21.

5. Forero S, Alvarez J, Doyle T. Hepatitis B outbreak associated with home health care in South Florida. October 2010 Epi Update. Available at: http://www.doh.state.fl.us/Disease_ctrl/epi/Epi_Updates/2010/October2010EpiUpdate.pdf [PDF - 21 pages]

6. Centers for Disease Control and Prevention. Multiple Outbreaks of Hepatitis B Virus Infection Related to Assisted Monitoring of Blood Glucose Among Residents of Assisted Living Facilities -- Virginia, 2009-2011. MMWR 2012; 61: 339-343.

7. Bancroft E, Hathaway S. Hepatitis B Outbreak in an Assisted Living Facility. Acute Communicable Diseases Program, Special Studies Report 2010, Los Angeles County Department of Public Health, pages 41-44. http://publichealth.lacounty.gov/acd/reports/SpecialStudiesReport2010.pdf [PDF - 89 pages]

8. Deaths from acute hepatitis B virus infection associated with assisted blood glucose monitoring in an assisted-living facility — North Carolina, August–October 2010. MMWR 2011; 60:182.

9. Tohme R, Awosika-Olumoc D, Nielsenb C, Khuwajac S, Scott J, Xing J, Drobeniuc J, Hu D, Turner C, Wafee T, Sharapov U, Spradling P. Evaluation of hepatitis B vaccine immunogenicity among older adults during an outbreak response in assisted living facilities. Vaccine 2011; 29: 9316-9320.

10. Unpublished data, Texas Department of Health, 2010. (*Manuscript in preparation*.)

11. Bender T, Wise E, Utah O, Moorman A, Sharapov U, Drobenuic J, Khudyakov Y, Fricchione M, White-Comstock MB, Thompson N, Patel P. Outbreak of hepatitis B virus infections associated with assisted monitoring of blood glucose in an assisted living facility — Virginia, 2010. *Submitted.*

12. Colborn JM, Williams RE, Moorman A, Roberts H, Khudyakov Y, Thompson N, Schaefer M, Sena A, Moore Z. Acute Hepatitis B Virus Infection Outbreak in a Long-Term Care Facility – North Carolina, 2010. 60th EIS Conference, Atlanta, GA, April 11-15, 2011. (*Manuscript in preparation*.)

13. Unpublished data, North Carolina Division of Public Health, 2010. (*Manuscript in preparation*.)

14. Unpublished data, Los Angeles County Department of Public Health, 2011.

15. Greeley RD, Semple S, Thompson ND, et al. Hepatitis B outbreak associated with a hematology-oncology office practice in New Jersey, 2009 Am J Infect Contr 2011; 39:663-70.

16. West Virginia Department of Health, unpublished data, 2009. *(Manuscript in preparation.)*

17. Enfield KB, Sharapov U, Hall K, et al. Transmission of hepatitis B virus to patients from an orthopedic surgeon. Presented at: 20th Annual Scientific Meeting of the Society for Healthcare Epidemiology of America (SHEA), Atlanta, Georgia, March 20, 2010.

18. Bancroft E, Hathaway S, Itano A. Pain Clinic Hepatitis Investigation Report. Acute Communicable Diseases Program, Special Studies Report 2010, Los Angeles County Department of Public Health, pages 33-36.
http://publichealth.lacounty.gov/acd/reports/SpecialStudiesReport2010.pdf [PDF - 89 pages]

19. Fischer G, Schaefer M, Labus B, et al. Hepatitis C virus infections from unsafe injection practices at an endoscopy clinic in Las Vegas, Nevada, 2007-2008. Clin Infect Dis 2010; 51:267-273.

20. Centers for Disease Control and Prevention. Acute hepatitis C virus infections attributed to unsafe injection practices at an endoscopy clinic — Nevada, 2007. MMWR 2008; 57: 513-517.

21. Southern Nevada Health District. Outbreak of hepatitis C at outpatient surgical centers, public health investigation report. December 2009. Available at: http://www.cchd.org/download/outbreaks/final-hepc-investigation-report.pdf [PDF - 266 pages]

22. Moore ZS, Schaefer MK, Hoffmann KK, Thompson SC, Guo-Liang X, Lin Y, et al. Transmission of hepatitis C virus during myocardial perfusion imaging in an outpatient clinic. Am J Cardiol. 2011;108:126-132.

23. Sanderson R, Atrubin D, Santiago A, et al. 2010. Hepatitis C outbreak at an outpatient infusion clinic- Hillsborough County, Florida 2009. APIC 2010 Annual Conference and Meeting. New Orleans, July 11-15, 2010.

24. Centers for Disease Control and Prevention. Investigation of Case Reports of Viral Hepatitis Infection Possibly Related to Healthcare Delivery: One Local Health Department's Approach. MMWR 2012; 61: 333-338.

25. Hellinger WC, Bacalis LP, Kay RS, Thompson ND, Xia GL, Lin Y, Khudyakov YE, Perz JF. Health care–associated hepatitis C virus infections attributed to narcotic diversion. Ann Intern Med 2012; 156: 477-82.

26. New York City Department of Health and Mental Hygiene, unpublished data, 2011.

27. Colorado Department of Public Health and Environment. Viral Hepatitis Program
http://www.cdphe.state.co.us/dc/Hepatitis/hepc/DataRelease%20CategoriesHepatitis%20C%20Virus5-14-2010%20weba.htm
http://www.cdphe.state.co.us/dc/Hepatitis/index.html

28. Centers for Disease Control and Prevention. Hepatitis C virus transmission at an outpatient hemodialysis unit — New York, 2001–2008. MMWR 2009; 58:189-194.

29. Rao A, et al. Outbreak of acute hepatitis C virus infections at an outpatient hemodialysis facility. Fifth Decennial International Conference on Healthcare-Associated Infections, Atlanta, March 18-22, 2010.

30. New Jersey Department of Health and Senior Services, unpublished data, 2009.

31. Texas Department of Health, unpublished data, 2010.

32. Mbaeyi C. Outbreak of hepatitis C virus infections in an outpatient dialysis facility—Georgia, 2011. 61st Annual Epidemic Intelligence Service (EIS) Conference, Atlanta, April 16–20, 2012.

Hepatitis B Immunization Guidelines

Use of Hepatitis B Vaccination for Adults with Diabetes Mellitus *(2011 update to 2006 guidelines below)*
http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6050a4.htm

A Comprehensive Immunization Strategy to Eliminate Transmission of Hepatitis B Virus Infection in the United States (2006)
http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5516a1.htm

Immunization of Health-Care Personnel. Recommendations of the Advisory Committee on Immunization Practices (ACIP)
http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6007a1.htm?s_cid=rr6007a1_e

Infection Control Guidelines and Resources

Evidence-based infection prevention guidelines for healthcare settings including those for disinfection and sterilization, environmental cleaning, and hand hygiene available at: http://www.cdc.gov/hicpac/pubs.html

Injection safety resources available at:
http://www.cdc.gov/injectionsafety/providers.html
http://www.oneandonlycampaign.org/

Infection prevention resources for assisted monitoring of blood glucose available at:
http://www.cdc.gov/injectionsafety/blood-glucose-monitoring.html

Setting specific resources available at:

General Outpatient: http://www.cdc.gov/HAI/settings/outpatient/outpatient-settings.html

Outpatient Oncology: http://www.cdc.gov/HAI/settings/outpatient/basic-infection-control-prevention-plan-2011/index.html

Hemodialysis: http://www.cdc.gov/dialysis/provider/index.html

Long-term care: http://www.cdc.gov/HAI/settings/ltc_settings.html

Dental: http://www.cdc.gov/OralHealth/infectioncontrol/guidelines/index.htm and http://www.osap.org/?page=ChecklistPortable